ISSN: 1130-3743 - e-ISSN: 2386-5660
DOI: https://doi.org/10.14201/teri.25600

STUDENT-CENTRED METHODS. THEIR EFFECTS ON UNIVERSITY STUDENTS' STRATEGIES AND LEARNING APPROACHES

Métodos centrados en el estudiante. Sus efectos en las estrategias y los enfoques de aprendizaje de los universitarios

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Date received: 23/01/2021
Date accepted: 01/05/2021
Date of online publication: 01/01/2022

How to cite this article: Barboyon Combey, L., & Gargallo López, B. (2022). Student-Centred Methods. Their Effects on University Students' Strategies and Learning Approaches. *Teoría de la Educación. Revista Interuniversitaria*, *34*(1), 215-237. https://doi.org/10.14201/teri.25600

ABSTRACT

At university, we are changing from a teaching-centred approach to a learning-centred approach. It is important to have scientific data about the use of such methodologies to evaluate both their usefulness and functionality. The aim of this research was to assess whether applying learning-centred methods would improve students' learning strategies and learning approaches compared to a control group that received teaching-centred training. This was a quasi-experimental cohort design with a non-equivalent control group. The sample consisted of 243 Pedagogy and Social

Education students at the University of Valencia (Spain) who studied the same year-1 course. The employed methods sought students' commitment and active participation by using questions, simulations, cooperative work and practical activities, and undertaking a research project, portfolios, etc. The obtained results were positive. The learning strategies of the students who participated in the educational intervention with the leaning-centred approach improved and their deep learning approach increased compared to their peers, who studied the same course by traditional methods. These results prove the validity of these methods and can motivate teachers to choose a learning-centred approach. Moreover, it is relatively easy to apply these methods in classrooms.

Key words: university students; learning-centred teaching; learning strategies; learning approaches; teaching-centred approach.

RESUMEN

En la universidad nos encontramos en un proceso de cambio, desde un modelo centrado en la enseñanza a otro centrado en el aprendizaje o en el alumno. Es relevante disponer de datos científicos de aplicación de este tipo de metodologías para evaluar tanto su utilidad como su funcionalidad. El objetivo de esta investigación fue valorar si la aplicación de métodos centrados en el aprendizaje provocaría mejora en las estrategias y los enfoques de aprendizaje de los alumnos con respecto al grupo control, el cual recibió formación con un formato metodológico centrado en la enseñanza. Se hizo uso de un diseño cuasiexperimental, de cohortes, con grupo de control no equivalente. La muestra estaba integrada por 243 estudiantes de Pedagogía y Educación Social de la Universidad de Valencia, que cursaban una materia de 1º curso. Los métodos utilizados buscaban el compromiso y la participación activa del alumnado haciendo uso de preguntas, simulaciones, trabajo cooperativo, actividades prácticas, realización de un trabajo de investigación, portafolios, etc. Los resultados que se obtuvieron fueron positivos. Los estudiantes que recibieron intervención educativa con métodos centrados en el alumno mejoraron sus estrategias de aprendizaje e incrementaron el enfoque profundo de aprendizaje en comparación con sus compañeros que habían cursado la misma asignatura con métodos tradicionales. Estos resultados son un exponente de la validez de estos métodos y pueden servir de motivación al profesorado para que se decante por un enfoque centrado en el aprendizaje, habida cuenta, además, de que su aplicación es relativamente fácil de articular.

Palabras clave: estudiantes universitarios; enseñanza centrada en el aprendizaje; estrategias de aprendizaje; enfoques de aprendizaje; métodos centrados en la enseñanza.

1. INTRODUCTION

In the history of education, we find approaches in which students lie at the centre of the training process. Nowadays, we talk about student- or learning-centred

approaches. Some significant milestones are Rousseau's approach or initiatives like those of Montessori, Decroly, Claparède, Cousinet or Freinet in the New School, in Progressist Education, among others. In Spain, the Krausist Free Teaching Institution is particularly significant. Contributions by relevant people like Piaget or Vygotsky can also be found, who questioned conductism by outlining new more relevant theories that better explain the learning process, while also recommending student autonomy, the need to personally construct meanings and to collaborate with others.

At the end of the past century, changes took place in university teaching-learning models that led to new considerations. Barr and Tagg (1995), with their initial reference work, contemplated the need for a change of paradigm in Higher Education training.

Barr and Tagg (1995) defended that university operated with a training approach that centred on teachers and instruction, namely the «instruction paradigm», —which today we would call an approach centred on teaching/the teacher (teacher-centred learning)— based on a teacher model that «knows» and «distributes» knowledge to students by a presentation methodology. This paradigm considers that the key of the teaching-learning process is good teaching.

The training process is interpreted as something cumulative, so that the «whole» is the sum of the parts, of the subjects and of the credits obtained. The subjects and the departments that teach them have a life of their own and «defend» themselves against external aggression. Teachers defend their «territory» against «others», fighting so that their subject to be present in the programs and the more presence it has, the better, taking into little consideration the competences or needs of the students, when designing study plans.

Conversely, the learning-centred paradigm (student-centred learning; learning paradigm) places students at the centre of the training process in an attempt to create learning environments that allow knowledge building and working with others to solve complex problems.

Changing this paradigm requires doing away with the compartmentalised teaching paradigm structure and designing the curriculum and academic degrees by identifying the competences that graduates must acquire. From this point, the learning outcomes that illustrate such an achievement are specified, and then training contents, methods and processes are selected. With this proposal, which absolutely connects the constructive alignment (Biggs, 2005), the whole is not only more than the sum of the parts, but is also organizes and governs these parts. It is not a matter of students accumulating credits, but of demonstrating that necessary learning has been acquired, as reflected in relevant learning outcomes.

Working on this line expects a quality evaluation and is able to value by achieving these outcomes which prove that competences have been mastered.

Apart from the theoretical work by Barr and Tagg (1995), some empirical works have been conducted by university professors, which they supplement by analysing

the teaching-learning process based on teachers' perceptions and specifying how they deal with the teaching, learning, evaluation and building of knowledge.

For these research works, a qualitative methodology was applied by analysing teachers' beliefs in these topics, as well as what they state they do when they are teaching. The followed approach is phenomenographic/interpretative and it resorts to interviews. As examples of such works, we cite Gow and Kember (1993), Kember and Gow (1994), Samuelowicz and Bain (1992, 2001), among others.

With these works, it is possible to confirm the coexistence of a traditional model that centres on teaching/the teacher, as well as a model that centres of learning/students /constructivist[1], whose influence on the training process has grown (McCoy *et al*., 2018). Both are differentiated in teaching and the evaluation.

Other research works, of which some are very recent, corroborate the survival of both models (Arman, 2018; Biggs, 2005; EI-ESU, 2010; Emaliana, 2017; García Valcárcel, 1993; Kember, 2009; Kember & Kwan, 2000; Motjolopane, 2021). The fact that the learning-centered model lies at the theoretical level since the end of the 20th century does not mean that it is the predominant model in pragmatic terms. The master class is still the most generalised method for university professors (Jiménez Hernández, González Ortiz & Tornel Abellán, 2020), albeit often contemplated with other methods.

The most significant characteristics of the two models are as follows:

The teacher-centred model attaches importance to teachers. Teachers' main task is to transmit their knowledge and that of students is to reproduce knowledge (Kember, 2009; Samuelowicz & Bain, 2001). The most widely used method is the master class. The teacher explains, students take notes, memorise and reproduce this information in an exam, which is the most frequently employed instrument to evaluate.

Conversely, the learning-centred model stresses student learning. It aligns with the constructivist perspective and understands knowledge as students' personal knowledge building. Here the objective is for students to develop the life-long skills, attitudes and values that they will need. Methods are followed that promote student engagement that supplements the master class (cooperative work, projects, problem-based learning, case studies, learning contract, etc.) and the evaluation is continuous/training. The teacher's objective with this model is for students to learn to learn.

1. The first publications about this theme did not explicitly associate the learning-centred model with the constructivist conception, although it is now agreed that this model is constructivist (EI-ESU, 2010; Carwile, 2007; Lavoie & Rosman, 2007; Serin, 2018) by emphasising students constructing/building knowledge, the importance of cooperative learning, the teacher's mediator role, the use of active methodologies and the relevance of interactivity, of using formative evaluations, etc.

This process of change toward this model has been favoured by the development of the European Higher Education Area because the Bologna process moved towards learning-centred universities (EC, 2007, 2009, 2012, 2015).

Having data of fruitful interventions may help teachers to decide on this option. This is what we intend to analyse in the present work by assessing the impact of student-centred methods on university students' learning.

To this end, we present the outcomes of a research work that involved implementing learning-centred methods by teachers form the Universidad de Valencia.

To analyze their impact on student learning, students' learning strategies were evaluated, which allow specifying how they display skills, techniques and procedures to learn effectively, as well as their metacognitive self-regulation capacity (Pintrich, 2000 and 2004; Yip, 2012; Zimmerman, 2002). Learning approaches were also evaluated, which allow specifying to what extent a student faces learning with a deep approach, or with a surface approach (Entwistle and Peteron, 2004; McCune and Entwistle, 2011; Ruiz et al., 2008).

2. Method

2.1. *Objectives*

Objective 1. Evaluate the impact of a methodological learning-centred format applied by three different teachers of two university degrees about how students learn, as specified in their learning strategies and approaches.

Objective 2. Analyse the teachers' influence on the efficiency of this format.

2.2. *Research design and phases*

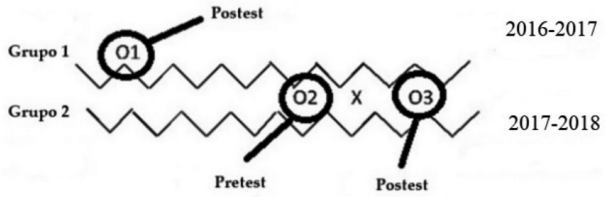
The research design was non-equivalent pretest/posttest quasi-experimental with both an experimental group and a control group (Campbell & Stanley, 1979; Shadish *et al*., 2002).

The key variable was the teachers' teaching and evaluation learning-centred format to determine its influence on the evaluated student-related variables. The quasi-experimental designs included a cohort design and natural class groups that shared vital characteristics and underwent specific intervention (Ato & Vallejo, 2007; Shadish *et al*., 2002).

In this case, the cohorts were the successive groups learning the same course (1st) and studying the same subject matter of a different degree/academic year. In this way, the groups of the first academic year (2016-17) (grouped in the graph entitled Group 1) did not undergo the specific intervention that the students of the second academic year did (2017-18) (grouped in Group 2). Therefore, the year-1 cohort was used as the control group (Shadish *et al*., 2002).

Initial data collection took place (posttest, O1) with the control groups during the first research study year, who finished their classes following the traditional methodology. In the next year, the learning-centred methodology was set up and the pretest (O2) and posttest (O3) were carried out in the experimental groups. This design enabled the experimental groups (underwent the intervention) and the control groups to be compared, and the (year 2) experimental groups' evolution from the pretest to the posttest to be analysed.

FIGURE 1
GRAPH OF THE INTERVENTION DESIGN



Source: the authors

2.3. *Population and sample*

The sample was made up of 243 university students, 64 from year 1 and 179 from year 2, studying Pedagogy and Social Education at the Universidad de Valencia, and learning the same year-1 subject matter.

Group 1 comprised the two subgroups in which two teachers, A and B, taught the same subject matter. Teacher A taught this in the Social Education group (34 students) and teacher B did so in the Pedagogy group (30 students). Group 2 was made up of three subgroups taught by three teachers, A, B and C. All three taught the same subject matter as in the previous year, teachers A and B did so in two Pedagogy groups (75 and 53 students, respectively) and teacher C, who did not participate in the previous course, did so in the Social Education group (51 students).

2.4. *Instruments*

In order to evaluate the learning strategies, the CEVEAPEU questionnaire by Gargallo *et al.* (2009) was used, which has 88 items, two scales, six subscales and 25 strategies (Table 1). Its internal reliability-consistency is $\alpha = .897$, and those of the two scales are $\alpha = .819$ and $\alpha = .864$. Its temporal reliability-consistency index is good and it predicts performance well.

TABLE 1
STRUCTURE OF THE CEVEAPEU QUESTIONNAIRE

Scales	Subscales	Strategies
Affective, support and control /self-management strategies (α = .819)	Motivational strategies (α = .692)	Intrinsic motivation (α = .500)
		Extrinsic motivation (α = .540)
		Task value (α = .692)
		Internal attributions (α = .537)
		External attributions (α = .539)
		Self-efficacy and expectations (α = .743)
		Conception of intelligence as modifiable (α = .595)
	Affective components (α = .707)	Physical and mental state (α = .735)
		Anxiety (α = .714)
	Metacognitive strategies (α = .738)	Knowledge of objectives and evaluation criteria (α = .606)
		Planning (α = .738)
		Self-assessment (α = .521)
		Control, self-regulation (α = .660)
	Context control, social interaction and resource management strategies (α = .703)	Context control (α = .751)
		Social interaction and learning skills with peers (α = .712)
Strategies related to information processing (α = .864)	Information search and selection strategies (α = .705)	Knowledge of sources and searching for information (α = .685)
		Selecting information (α = .630)
	Information processing and using strategies (α = .821)	Acquiring information (α = .677)
		Elaboration (α = .739)
		Organization (α = .810)
		Personalization and creativity, critical thinking (α = .771)
		Storage, Memorization, Using mnemonic resources (α = .765)
		Storage, Simple repetition (α = .691)
		Transfer, using information (α = .656)
		Resource management to use acquired information (α = .598)

Source: Gargallo, Garfella, Sahuquillo, Verde, and Jiménez (2015)

In order to assess the learning approaches, the CPE questionnaire was employed, specifically its R-SPQ-2F Spanish translation of Biggs *et al.* (2001), with 20 items divided into two scales: surface approach (10 items) and deep approach (10 items), subdivided into two factors: motives (surface and deep) and strategies (surface and deep) (Gargallo**,** Garfella, Sahuquillo, Verde, & Jiménez**,** 2015). Table 2 presents its structure and reliability data.

TABLE 2
STRUCTURE AND INTERNAL RELIABILITY-CONSISTENCY DATA OF THE CPE QUESTIONNAIRE

Scales	**Scales**
I. Deep approach (α = .812)	Deep motive (α = .631)
	Deep strategy (α = .688)
II. Surface approach (α = .795)	Surface motive (α = .652)
	Surface strategy (α = .706)

Source: Gargallo, Garfella, Sahuquillo, Verde, and Jiménez (2015).

2.5. *Procedure*

The students in Group 1 answered the questionnaires when the teaching of the subject ended during academic year 2016-17 as the posttest by contextualising the responses on the subject matter and in the teaching that they received from their teachers.

The students in Group 2 answered the questionnaires when the teaching of the subject matter started (pretest; academic year 2017-18) by contextualising their responses in the usual way done to cope with learning, and they answered them again when teaching ended (posttest) by thinking about the subject matter and their teachers.

The employed learning-centred methodological format includes different teaching and evaluation methods, and aligns with the constructive alignment approach (Biggs, 2005), and a link among objectives, contents, tasks, and teaching and evaluation methods occurred.

All the participating teachers used the same teaching guide and methods. Competences, learning outcomes, contents, tasks and materials were briefly presented. Students had to work autonomously and answer a series of questions about each theme via the virtual class. In class, debates about the prepared questions with different levels of difficulty took place based on students' autonomous work. Firstly, a small group worked and discussed responses, which were then shared in a larger group to seek consensuses and to explain any doubts with the teacher's help and involvement, who provided the necessary explanations.

Practical sessions were held to work on the scheduled knowledge, skills and attitudes by means of cases, games, simulations, videos, cooperative work techniques, etc. During the 4-monthly period, cooperative research work was done about lifelong learning in a given place (district, city, small town) to analyse the available resources and their use by collecting information from key informants (authorities, head masters/headmistresses, professionals, etc.). They had to prepare a written work report and give an oral presentation in class. This presentation was evaluated by the teacher and his/her colleagues. Everyone who participated in the group work co-evaluated their colleagues with set evaluation criteria.

They also had to deliver two portfolios that evidenced the acquired learning, which included the questions debated in class, practical work reports, a group research work report, metacognitive reflection questions about the process followed, a self-assessment and a co-evaluation of group work. The teachers offered the students feedback by returning corrected portfolios, and this feedback acted as a teaching-learning and evaluation instrument.

Thus the following teaching methods and techniques were employed: participative master class, questions on the subject matter, discussion about the questions, practical work in class (by different techniques), preparing group research work, cooperative work, group work presentations and a portfolio. The evaluation methods and techniques were: a written open-answer test (40% of the final mark), a portfolio (60% of the final mark), a co-evaluation and a self-assessment.

2.6. *Statistical analyses*

The SPSS 22.0 package for Windows was employed to perform the univariate ANOVA for the intergroup comparison. For the intragroup comparison, a mixed ANOVA (MLG repeated measures method) was used with an estimated effect size (partial $\eta 2$).

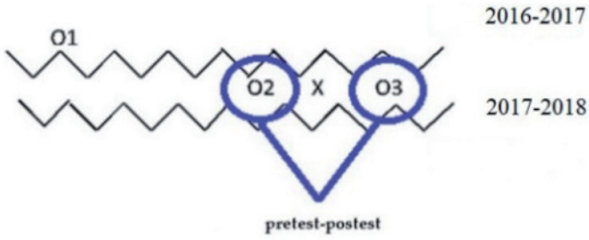
3. Results

The results are presented as two blocks: the first block includes the individuals from each year as a single group where the students from the two year-1 groups acted as the control group (traditional methodology), and the students from the three year-2 groups acted as the experimental group (learning-centred methods). In the first group, the intragroup analysis results obtained with the strategies and approaches were firstly presented to reflect the experimental group's evolution from the pretest to the posttest. Next the intergroup analysis results were presented by analysing the differences in the posttest in the experimental subjects (year 2) and the control subjects (year 1).

In the second block, the results obtained by the experimental subjects (year 2) were presented group by group (intragroup analysis) because, although the three

groups followed the same methodology (learning-centred), they belonged to the three different class groups, each with its own teacher. This was done to analyse the teacher effect on the employed learning-centred format.

FIGURE 2
COMPARATIVE PRETEST-POSTTEST ANALYSIS



Source: the authors

3.1. *The results obtained by grouping the individuals from each year in a single group*

3.1.1. Intragroup analysis

3.1.1.1. Results in strategies

Significant pretest/posttest differences were found in: the overall average score, and an improvement in the posttest was observed, $p < .001$, partial $\eta^2 = .152$ (large effect size); on the first scale, affective, support and control/self-management and strategies, $p < .001$, partial $\eta^2 = .107$ (medium effect size); on the second scale, data-processing strategies, $p < .001$, partial $\eta^2 = .142$ (large effect size). The posttest scores on both these scales improved.

Significant differences appeared for five of the six subscales: metacognitive strategies, $p < .001$, partial $\eta^2 = .069$, context control, $p < .001$, partial $\eta^2 = .085$, seeking and selecting data, $p < .001$, partial $\eta^2 = .106$ and processing and using data, $p < .001$, partial $\eta^2 = .114$. They all had a medium effect size, but the effect size was small for motivational strategies, $p < .05$, partial $\eta^2 = .033$.

No significant differences were found in the affective components subscale, although the mean was higher in the posttest, and in physical/emotional state the results were close to the level of significance.

Significant differences were found in 16 of the 25 strategies:

In three of the seven motivational strategies: intrinsic motivation, self-efficacy, and external expectations and attributions.

In three of the four metacognitive strategies: knowledge of objectives and evaluation criteria, control and self-regulation/self-evaluation.

Likewise, in the two context control strategies: context control and social interaction skills.

Also, in the two search and selection strategies: knowledge of sources and search, and selection.

Finally, in six of the eight processing and use strategies: elaboration, organization, personalization and creativity, critical thinking, storage, memorization and use of mnemonic resources, transfer and use of information, and resource management to use the acquired information.

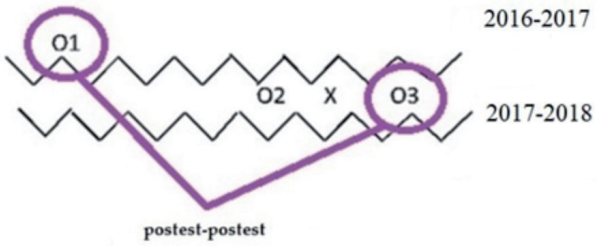
In the other strategies there were also improvements, although not statistically significant.

3.1.1.2. Results obtained with the approaches

Significant pretest/postTest differences were found in the average score of the surface approach, $p < .01$, partial $\eta^2 = .04221$, which lowered, and in the deep approach $p < .01$, partial $\eta^2 = .05354$, which increased (small effect size). Statistically significant differences were also observed in the partial scores for strategy and motive.

3.1.2. Intergroup analysis

FIGURE 3
COMPARATIVE POSTTEST-POSTTEST ANALYSIS



Source: the authors

3.1.2.1. Results in the learning strategies

Significant differences were observed between: both posttests (2016-2017 and 2017-2018) in the overall average score, which favoured the experimental subjects, $p < .001$; on the first scale of affective strategies, $p < .001$; on the second scale of processing-related strategies, $p < .001$, and also favoured the experimental subjects.

Significant differences also favoured the experimental subjects on five of the six subscales: the motivational, $p < .001$, metacognitive, $p < .001$, controlling the context, $p < .001$, data seeking, $p < .01$, and data processing, $p < .001$, strategies. They also occurred in 18 of the 25 strategies:

In three motivational strategies: intrinsic motivation, task value and self-efficacy and expectations; in an affective strategy: physical and mental state; in the four metacognitive strategies: knowledge of objectives and evaluation criteria, planning, self-evaluation, control and self-regulation; in two context control strategies: context control and social interaction skills; in a search and selection strategy: knowledge of sources and search for information; and in seven of the eight information processing and use strategies: acquiring information, elaboration, organization, personalization and creativity, critical thinking, storage/memorization/use of mnemonic resources, storage by simple repetition, and transfer and use of information.

3.1.2.2. Results in the learning approaches

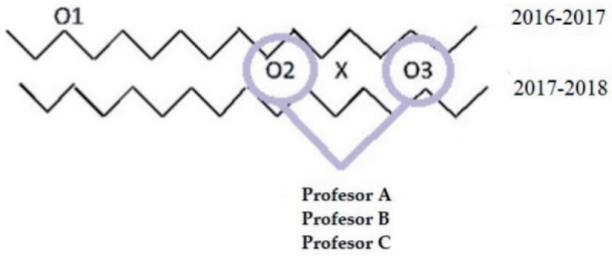
Statistically significant differences were found, and favoured the experimental group, in both the surface $F(1, 219) = 27.966$, $p < .001$ and deep $F(1, 219) = 8.76737$, $p < .01$. approaches, and also in the partial strategy and motive scores. The surface approach scores were higher for the control subjects, while the deep approach scores were higher for the experimental subjects.

3.2. *Results obtained by the year-2 individuals separated into groups*

3.2.1. Intragroup analysis

These results are presented by separating the students into class groups and teachers.

FIGURE 4.
COMPARATIVE PRETEST-POSTTEST ANALYSIS



Source: the authors

3.2.1.1. Results for teacher A

Teacher A teaches the subject in the Pedagogy degree.

3.2.1.1.1. Results in the learning strategies

Statistically significant pretest/posttest differences were found: in the overall average questionnaire score, and an improvement was observed in the posttest, $p <$ .01, partial $\eta^2 = .102$ (medium effect size); on the first scale of the affective, support and control strategies, $p < .05$, partial $\eta^2 = .063$ (small effect size); on the second scale of the data processing-related strategies, $p < .01$, partial $\eta^2 = .123$ (medium effect size); six of the subscales: metacognitive strategies, $p < .05$, partial $\eta^2 = .071$ and data processing/use strategies, $p < .05$, partial $\eta^2 = .093$ (medium effect size). This was not, however, the case of the other four subscales, although the affective components came close to the level of significance, $p = .05$.

There were significant differences in five strategies: one of the four metacognitive strategies: control, self-regulation, $p < .05$, partial $\eta^2 = .067$, and four of the eight of information processing and use: elaboration, $p < .05$, partial $\eta^2 = .068$, organization, $p < .05$, partial $\eta^2 = .064$, personalization and creativity, critical thinking, $p < .05$, partial $\eta^2 = .070$, storage, memorization and use of mnemonic resources, $p < .05$, η^2 partial = .079.

3.2.1.1.2. Results in the learning approaches

No statistically significant differences were found on either scale or their factors, although the deep approach and strategy scores came close to the .05 significance value ($p = .065$ for the deep approach and $p = .080$ for the deep strategy). The deep approach scores rose and the surface approach scores lowered.

3.2.1.2. Results for teacher B

Teacher B teaches the subject in the Pedagogy degree.

3.2.1.2.1. Results in the learning strategies

Statistically significant pretest/posttest differences were found in: the overall average questionnaire score and an improvement in the posttest, $p < .05$, partial $\eta^2 = .127$ where the effect size was medium; on the second scale of data processing-related strategies, $p < .01$, partial $\eta^2 = .176$, with a large effect size.

Significant differences were observed from the pretest to the posttest on three subscales: seeking/selecting strategies, $p < .001$, partial $\eta^2 = .218$, and processing/using strategies, $p < .05$, partial $\eta^2 = .116$, with a large effect size, and metacognitive strategies, $p < .05$, partial $\eta^2 = .088$, with a medium effect size.

There were significant differences in seven strategies: two motivational strategies: intrinsic motivation, $p < .05$, partial $\eta^2 = .086$ (medium effect size) and self-efficacy and expectations, $p < .05$, partial $\eta^2 = .187$ (large effect size); a metacognitive one: knowledge of objectives and evaluation criteria, $p < .01$, partial $\eta^2 = .19$ (large effect size); two of information search and selection: knowledge of sources and information search, $p < .01$, partial $\eta^2 = .188$ (large effect size), and information selection, $p < .05$, partial $\eta^2 = .109$ (medium effect size), and two for processing and use:

personalization and creativity / critical thinking, p <.01, partial η^2 = .162 (large effect size), and storage, memorization and use of mnemonic resources, p <. 05, partial η^2 = .089 (median effect size).

3.2.1.2.2. Results in the learning approaches

Statistically significant differences appeared in not only the overall deep approach score $F(1, 44) = 7.35818$, $p < .01$, partial $\eta^2 = .14327$, with a large effect size, but also in the partial scores of this approach.

The partial approach scores lowered in the posttest.

3.2.1.3. Results for teacher C

Teacher C teaches the subject in the Pedagogy degree.

3.2.1.3.1. Results in the learning strategies

Statistically significant pretest/posttest differences were found in: the overall average questionnaire score, along with an improvement in the posttest, $p < .001$, partial $\eta^2 = .262$, with a large effect size; on the first scale of the affective, support and control strategies, $p < .001$, partial $\eta^2 = .263$, and on the second scale of the processing-related strategies, $p < .01$, partial $\eta^2 = .156$, with a large effect size; on four of the six subscales: motivational strategies, $p < .05$, partial $\eta^2 = .144$, of controlling the context, $p < .001$, partial $\eta^2 = .268$ and for processing/using, $p < .01$, partial $\eta^2 = .153$, with a large effect size. Statistical differences were also noted in searching/selecting strategies, $p < .05$, partial $\eta^2 = .112$, with a medium effect size.

Considering the strategies, there were statistically significant differences in nine: three motivational strategies: intrinsic motivation, p <.001, partial η^2 = .266, self-efficacy and expectations, p <.01, partial η^2 = .220, with large effect size, and internal attributions, F (1, 41) = 4.437, p <.05, partial η^2 = .098, with medium effect size; two of context control: context control, p <.001, partial η^2 = .267, social interaction skills, p <.01, partial η^2 = .187, both being the size of the large effect; one of the information search and selection strategies: information selection, p <.05, partial η^2 = .102, with a medium effect size; and three processing and use strategies: organization, p <.05, partial η^2 = .148, with large effect size, storage/memorization/use of mnemonic resources, p <.05, partial η^2 = .102 and transfer, use of the information, p <.05, partial η^2 = .103, with medium effect size.

3.2.1.3.2. Results in the learning approaches

Statistically significant differences were found from the pretest to the posttest in the overall surface approach scores, $p < .01$, partial $\eta^2 = .18270$, with a large effect size, and the scores in the posttest lowered, as did the partial scores. The deep approach scores improved in the posttest, and without significant differences.

TABLE 3
SYNTHESIS OF RESULTS

Analysis of differences performed (ANOVAS)		Results obtained
In experimental subjects (2016-17)	In learning strategies (pretest-posttest)	Significant differences in: Global score 2 scales 5 subscales 16 strategies
	In learning approaches (pretest-post-test)	Significant differences in: Surface approach (decreased) Deep approach (increased)
Between experimental and control subjects in the post-test (2016-2017 and 2017-2018)	In learning strategies	Significant differences in: Global score 2 scales 5 subscales 18 strategies
	In learning approaches	Significant differences in: Higher scores for the surface approach in the control subjects and deep approach in the experimental subjects
Of the experimental group students; students of professor A	In learning strategies (pretest-post-test)	Significant differences in: Global score 2 scales 2 subscales 5 strategies
	In learning approaches (pretest-post-test)	Scores of the deep approach and deep strategy were close to the significance value
Of the experimental group students; students of professor B	In learning strategies (pretest-pos-ttest)	Significant differences in: Global score 1 scale 3 subscales 7 strategies
	In learning approaches (pretest-posttest)	Significant differences in the global deep approach score
Of the experimental group students; students of professor B	In learning strategies (pretest-post-test)	Significant differences in: Global score 2 scales 4 subscales 9 strategies
	In learning approaches (pretest-post-test)	Increase in the global scores of the surface approach, decreasing the scores in the posttest

Source: the authors

4. Discussion and conclusions

The first objective of this work was to evaluate the impact of applying a learning-centred methodological format on the way that university students learn by centring on their learning strategies and approaches.

The results obtained from analysing the evolution from the pretest to the post-test (intragroup analysis) of the joint experimental group individuals were very positive: students' scores for learning strategies substantially improved. The overall questionnaire score significantly improved, as did those of the two scales and five of the six subscales (motivational, metacognitive, controlling the context, seeking/selecting and processing). Statistically significant improvements were observed in 16 of the 25 evaluated strategies.

Statistically significant pretest/post-test differences were found in the overall scores of the deep and surface approaches and in the partial scores for motive and strategy, while the deep approach score rose and the surface approach score lowered in the post-test.

The scores obtained in the post-test by the subjects in Groups 1 and 2 (intergroup analyses) were compared. Group 1 acted as the control group, whose teachers followed a traditional methodology, and Group 2 underwent the specific learning-centred intervention during academic year 2017-18.

There were statistically significant differences, in favor of the experimental subjects, in the global score of the questionnaire, in those of the two scales, in five of the six subscales and in eighteen of the twenty-five strategies.

In learning approaches there were statistically significant differences, in favor of the experimental group subjects, with higher scores in deep focus and lower in shallow focus.

Our results showed positive effects for using learning-centred methodologies on the way that university students learn, whose learning strategies/approaches improved. The results clearly came over when analysing the evolution of the Group 2 individuals from the pretest to the post-test, and also when comparing in the post-test the results from both Group 1 (the individuals from academic year 2016-17 who studied the same subject with two of teachers by the traditional methodology) and Group 2 (the individuals from academic year 2017-18, who studied the same subject with the two above teachers, plus another teacher, by learning-centred methods). The intergroup comparison conferred the results robustness by means of a quasi-experimental design.

The second objective was to analyse teachers' influence on the efficiency of the learning-centred methodological format. In this case, the year-2 students (Group 2) were separated into class groups and teachers (A, B and C).

The three groups improved.

Teacher A's student group improved in strategies (overall score), the two scales, two of the six subscales and five of the 25 strategies, but not in approaches.

Teacher B's group obtained better scores in strategies (overall score), the first scale, three of the six subscales and seven strategies, and also in approaches (the deep approach scores increased).

Teacher C's group improved in strategies (overall score), the two scales, four of the six subscales and nine strategies. In approaches, the surface approach scores lowered.

The results were slightly better in Teacher C's group, followed by Teacher B's group, and finally by Teacher A's group. This means that, as expected, although the followed methods were the same, the teacher variable acted as a modulator element of the intervention results.

We believe that this improvement was logical bearing in mind the employed methods. For these methods to work well and to be more participative, and to favour students' autonomy, the following are required: more commitment, more engagement, good planning, and having self-assessment/self-regulation capacity, and a deep learning approach. Students must always take an active attitude towards the subject, work autonomously before classes, and personally investigate using the questions they must answer, and also in class, because questions are put to debate. Students must also develop cooperative and self-regulation skills to competently perform group work. Likewise, having to prepare a portfolio emphasises these precise skills and attitudes, particularly the metacognitive skills that are worked in this portfolio, which includes questions about reflecting on the process followed to perform the task.

The literature contains similar examples to our own, with not very big sample. Some offer positive results, unlike others:

There is the case study by Li and Guo (2015), who introduced learning-centred methods, and included a small university sample and cooperative work, and students made positive evaluations of these methods.

Chen Zhou *et al.* (2015) redesigned a physiopathology laboratory course to favour critical thinking and learning self-management by more active learning. By means of a quasi-experimental design, the experimental group's results were significantly better in lab tests and in students' evaluations compared to the control group that followed conventional methods.

García-Carpintero (2017) introduced portfolios as a teaching, learning and evaluation method to a group of year-4 Nursing students from a Spanish university. Student evaluations were positive.

Turner and Webster (2017) introduced the flipped classroom method into an engineering course using group discussion and problem solving. These authors compared their results to those of the other students who followed a traditional

methodology. They obtained slightly better results for problem solving and technical content, but also reported a negative reaction to the teaching methods that the students were not familiar with.

Maya Díaz *et al.* (2021) used the flipped classroom method to motivate the engagement and commitment of students of three Chemistry Degree subjects at the Universidad de Sevilla and one Chemistry Degree subject at the Universidad de Barcelona. These authors used a quasi-experimental design with a control group that followed a traditional methodology (105 subjects) and an experimental group following the flipped classroom method (147 subjects). They reported improved academic outcomes for tests about the contents worked on.

Medina *et al.* (2021) applied the flipped classroom method and team learning combination in five groups with 318 year-2 students of the Business Administration and Management degree at the Universidad de Barcelona. They noted a positive impact on the results obtained in the questionnaires about the contents they had been taught.

Although it is true that most of the above-cited studies indicate positive results, their results derive from either student evaluations or questionnaires about certain contents. In our case, the results revealed significant improvements in students' learning strategies and approaches by evaluating these two constructs with validated questionnaires that are widely used in the scientific literature (CPE and CEVEAPEU). We firmly believe that, given the obtained data, these results derive from a change to the followed learning-centred training model, which involved a general reorientation of teaching-learning and teaching-evaluation processes (Arroyo, 2018), whose leitmotif was students' autonomous learning, joint knowledge building and their favoured self-regulation. As we see it, this explains the impact of our consideration on students' learning processes, strategies and approaches. We did not employ a single specific technique as most studies have done which, from our point of view, is a limitation of the reviewed studies because they boiled down to sporadic initiatives in line with minor changes.

Our obtained results are coherent with those found by other works showing the impact of using learning-centred methods with students' capacities and how they perceive the learning environment (Gargallo, Cebriá, *et al.*, 2017; Gargallo *et al.*, 2018) and styles (Gargallo, Pérez, *et al.*, 2017), and also with strategies and performance (Gargallo *et al.*, 2014).

By way of conclusion, we point out that to obtain the ideal situation for the learning-centred approach to find its true dimension and be generalised, it would be necessary to set up these methods in degrees and complete centres, and even the whole university, if at all possible. This was the case of the research by Kember (2009), who designed a work method to integrate learning-centred teaching into a Hong Kong university. This they did by holding interviews with particularly good

teachers to delimit protocols and models of good practices, training for young teachers, setting up innovative projects implemented by teachers committed to this model, evaluating innovative projects, and teachers revising the quality of these projects with the help of an external expert.

Kember (2009) contributed data about the partial success of implementation, how students perceived the learning process set up by teachers and students developing capacities. This author foresaw completing the data when the process ended in future publications, but we were unable to find them.

Another interesting initiative was that by Lavoie and Rosman (2007) from Connecticut University. To carry it out, they considered a teacher training programme by taking a student-centred approach so that teachers (who were then the students) could carry it out later with their own students to learn to design their courses in accordance with this approach. The authors indicated improved learning and more active student commitment, and they perceived more coherence with their proposal.

Moving from a traditional approach to a learning-centred one is no easy task (Heise & Himes, 2010) because it is ambitious and has to be implemented into degrees, centres and the university as a whole, and resistance may be marked (Barr & Tagg, 1995) because the whole university structure could be affected. Such a process requires changes in the organisation's philosophy, in the organisation itself, and the corresponding institutional policies (De La Sablonnière *et al.*, 2009). It is necessary to do away with rigid barriers of departments and knowledge areas to be able to engage teachers (Tracy & Gutiérrez, 2019). To this end, their training is essential so they can make a commitment. Older teachers are more reluctant to change than young ones (Blumberg, 2016), and all this also requires students getting involved (Maclellan, 2008).

While no institutional initiatives like those herein indicated become well-established, the results that we herein present can help to encourage teachers to use learning-centred methods given the positive consequences of applying them and they are quite easy to set up.

We do not wish to end without mentioning some study limitations. Our sample is not representative of either the general population or the university, which is quite usual in such studies because of the difficulty of forming representative samples and working with them in training processes. Moreover, quasi-experimental designs are robust enough to ensure control groups being used. Another limitation is the certain imbalance between the experimental groups and the control group because, from year 1, it was only possible to use two groups as teachers did not participate in the third group, plus the small number in the two year-1 groups vs. the year-2 ones.

Despite these limitations, we believe that our study contributes relevant data and can help both teachers and researchers to move forward.

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